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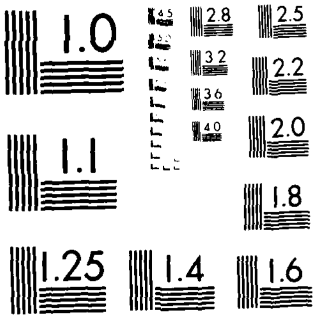

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AIR FORCE THIRD PARTY FINANCING MANAGEMENT GUIDE

W. J. HUFF, D. WILNER, S. NOLL

ULTRASYSTEMS INCORPORATED
EASTERN OPERATIONS
10340 DEMOCRACY LANE FAIRFAX, VIRGINIA 22030

MAY 1984

FINAL REPORT
JAN 1983 - MAY 1983

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This study examines the various methods of financing thermal and cogeneration projects to meet an individual Air Force installation's energy requirements. Additionally, it attempts to identify those management issues relating to third-party operations that have heretofore posed potential impediments to successful implementation. Finally, specific alternative means addressing these issues are identified.

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PREFACE

This report was prepared by Ultrasystems Incorporated, Eastern Operations, 10340 Democracy Lane, Fairfax, Virginia 22030, for the U.S. Army Facilities Engineering Support Agency, Fort Belvoir, Virginia 22060. The project was sponsored by the Air Force Engineering and Services Center, Tyndall Air Force Base, Florida 32403, as part of its Investigational Engineering Program. The Project Manager was Mr. Freddie L. Beason, Energy Group. Funding was provided via USAF MIPR N-83-33 dated 24 November 1982 to the U.S. Army Facilities Engineering Support Agency, which sponsored the work through Army contract DACA 31-80-D-0020, Work Order A 00006. The Army Project Managers were Mr. Steven A. Helms and Mr. James Thompson. This report documents work performed during the period January 1983 to May 1983.

This report has been reviewed by the Public Affairs Office (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS it will be available to the general public, including foreign nationals.

This technical report has been reviewed and is approved for publication.

Freddie L Beason
Freddie L. Beason, P.E.
Mechanical Engineer/Energy

Richard O Cardinale
Richard O. Cardinale
Major, USAF
Assistant Chief, Energy Group

George R Tate
George R. Tate
Colonel
Chief, Energy Group

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EXECUTIVE SUMMARY

Defense Energy Program Policy Memorandum (DEPPM) 83-1 sets forth Defense Energy Management Priorities for 1983. First priority actions, ". . . are designed to lessen DOD's vulnerability to national energy supply disruptions." Additionally, DEPPM 83-1 calls for the development of, ". . . energy conservation and conversion projects at select military installations using private capital for design, construction, operation and maintenance." These two goals can be met through Third Party Financing of energy production projects at selected Air Force installations.

This study examines the various methods of financing thermal and cogeneration projects to meet an individual Air Force installation's energy requirements. Additionally, it attempts to identify those management issues relating to "third-party" operations that have posed potential impediments to successful implementation. Finally, specific alternative means addressing these issues are identified.

The six basic points that surfaced during the course of the study are summarized below:

- Cogeneration application makes economic sense for many military installations based on the increased fuel efficiency of the simultaneous production of thermal and electrical energy. The Public Utility Regulatory Policies Act of 1978 (PURPA) allows qualifying cogenerators to sell their power back to the utilities at the utilities' avoided cost. Where favorable electric rates exist, this can reduce the incremental cost of thermal production to both the developer and the Air Force.

  Cogeneration also can offer increased installation energy security by providing onbase power generation capability to complement emergency diesel and gas-turbine generators, thus increasing the power available to meet crises.

- Some substantial financial and operational risks that are inherent in the current methods of meeting installation energy requirements. Third Party Financing can be structured so that the operational risks of mission impact are less than now encountered. This can be accomplished by proper risk identification and confinement through specific contractual provisions.

- Substantial interest and capability exists within the private sector to finance, operate, and maintain energy installations for the military. This was demonstrated by the receipt of over 95 Phase I proposals to the State of California for 11 cogeneration projects. Additionally, major U.S. corporations, such as General Electric, Ultrasystems, Foster-Wheeler, and Garrett-Wheelabrator Frye, have indicated specific interests and total capability to [illegible] design, construct, operate, and maintain energy generation facilities for Air Force installations. A specially tailored contract framework may be necessary to attract these interests in order to ensure that the large bidding expenses necessitated (over $100,[illegible]) are incurred only by pre-qualified bidders.

- One of the most compelling reasons for Third Party Financing is not the design, construction, or operational savings offered by tax-assisted private developers, but rather the opportunity to undertake needed projects now. Many requirements will not be met in the near term without Third Party Financing from the private sector.

- To provide energy security for base operations and to increase the potential economic return of a project (by emphasizing capacity payments from the utility), cogeneration projects should be structured with an electrical emphasis and secondary thermal consideration. The fluctuating seasonal thermal loads encountered on most Air Force installations would be satisfied while maximizing project revenues.

- A shared approach to financial risks associated with long-term energy generation projects between the developer and the Air Force may offer the greatest return to the Air Force from both an operational and financial standpoint. An adversarial contract approach may be avoided by such arrangements as sharing in the pretax cash flow of a project. Both parties in this case share a mutuality of self- interest. Additionally, the Air Force avoids paying the developer to hedge worst-case financial risks.

This study sets forth the above conclusions. When the Air Force plans to undertake a Third Party Financing project, it is important that this project be structured to improve the energy security and energy efficiency of the installation involved while reducing the life-cycle operating costs of providing energy.

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SECTION I

INTRODUCTION

1. BACKGROUND

The military services and the Department of Defense, collectively, own and operate over 1,500 major installations in the continental United States and several hundred more in overseas locations. Each of these installations consumes a significant amount of energy. Wright-Patterson Air Force Base, for example, consumes 6,300,000 MBtu's annually at a cost of over $20 million. Traditionally, military installations purchase electricity from regulated public utilities with thermal energy provided by installation-owned and -operated steam plants which use oil, natural gas and, less frequently, coal for fuel.

With the re-emergence and re-emphasis of alternate and renewable energy forms in the 1970s and the dramatic increases in energy costs in 1973-74 and 1979-80, the military services began to seek alternatives to their classic means of obtaining energy. Because of budgeting constraints on capital funds and personnel costs, the alternatives sought included Third Party Financing of energy production facilities.

The National Energy Act (NEA) of 1978 had, as one of its primary goals, the nationwide reduction of oil and natural gas consumption. The Department of Defense implemented the NEA through the establishment of goals and objectives that require the military services to plan boiler conversions/replacements using coal or alternative fuels as the primary fuel. In the integration of Third Party Financing of energy production facilities into the oil and gas backout scenario, renewable fuel technologies take a prominent role. Coal conversions, although acceptable as a consideration in alternative financing projects, lack some of the tax credit and other financing incentives that may be necessary to enhance the project economics for private investment. Accordingly, in highlighting the available incentives for Third Party Financing, this discussion necessarily addresses renewable/alternate fuel technologies as they specifically apply. In the last analysis, site considerations, fuel availability and financial structure will dictate the best fuel and/or technology to use. Nuclear systems may also be considered for Third Party financed applications; but, because the Air Force is investigating its applications in a separate, specialized initiative, they will not be considered in this report.

As shown in Table 1, five renewable technologies are positioned to provide, in the aggregate, significant amounts of energy in the near- to mid-term (5-15 years). These technologies are the same as those used today and, in order of their current production levels, are:

- Direct combustion of wood to provide industrial process heat, steam and electricity.

- Cogeneration of electricity and industrial process heat or steam

[illegible]	[illegible]	[illegible]	Moderate	Significant	Significant	Oil Gas Nuclear	Environmental Capital	None
[illegible]	[illegible]	Significant	Significant	Significant	Significant	[illegible]	Availability Fuel Cost	None
[illegible]	[illegible]	[illegible]	Significant	Significant	Significant	[illegible]	Availability Fuel Cost	None
[illegible]	[illegible]	[illegible]	[illegible]	Moderate	Significant	[illegible]	Market [illegible] Capital	[illegible]
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[illegible]	[illegible]	None	None	None	Limited	Oil Gas	Capital Technological Market Transportation	Financial Technology Demonstration
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Limited	[illegible] Fuels	Technological Capital	Institutional Financial Technology
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[illegible]	[illegible]	[illegible]	[illegible]	None	[illegible]	Nuclear	Technological	None
[illegible]	[illegible]	None	[illegible]	None	[illegible]	Gas	Technological	None

o Fermentation of biomass, primarily corn, into fuel-grade alcohol.

o Generation of electricity and thermal energy from geothermal resources.

o Direct combustion of municipal and industrial wastes to steam and/or electricity.

Each of these alternative energy processes has a range of technical advantages which has helped it establish itself in the energy marketplace. These include the use of:

o Relatively simple and widely understood conversion processes requiring a limited amount of technologically advanced equipment.

o Readily available, "off-the-shelf" equipment which is designed, engineered and manufactured by a diverse selection of companies.

o Relatively short construction times of 2-3 years from conception to start-up rather than the 7-10 years typical for many large-scale technologies.

o A fuel source which is generally available (with the exception of geothermal).

Each of these alternative energy technologies also has the advantage of being able to produce high-value output energy which is widely used in military applications. In particular, each of these fuels can displace petroleum, natural gas, and coal. Additionally, many of these technologies have the added benefit of resolving waste disposal problems, improving localized resource utilization, and lessening supply disruption potential.

Although the technical feasibility and economic attractiveness of these five technologies have been demonstrated, several financial concerns regarding their use have impeded their development. These include:

o Difficulty in attracting equity capital.

o Problems in entering into long-term contracts for the supply of feedstocks and for the sale of the project's output.

o Negative cash flows in the early operating years.

o Difficulty in gathering information and securing the decisions required to develop projects from all levels of base, command, and executive staff levels.

To reach their feasible potential, developers of these technologies must overcome the above obstacles.

A number of these technologies can be applied to a substantial portion of Air Force energy requirements in the mid- and long-term. Although these technologies possess some advantages, they also face significant obstacles which must be resolved before they can be fully developed. These include:

- o The expense and risk of building high-cost facilities with long lead times.

- o The use of technologies which currently require additional development.

- o Uncertainties regarding markets for some of the products that such facilities will produce.

- o Lack of an infrastructure to transport the energy which these facilities will produce.

A broad range of companies is pursuing alternative energy technology development. Their activities span the full range of the product development cycle from basic research through construction and operation. Most of these activities are focused on technologies which can help solve some of their current problems and which have short payback periods. Corporate interest is focused on technologies which utilize proven processes, have modest capital costs, utilize wastes or other low-cost fuels, and which produce products with an existing market. Specifically, corporate interest is focused on the:

- o Direct combustion of wood to produce steam and heat.

- o Direct combustion of municipal and industrial waste to produce energy.

- o Installation of cogeneration systems to produce electricity and industrial process steam or heat.

- o Development of locally specific geothermal resources.

- o Fermentation of biomass (primarily corn) with distillation to make fuel alcohol.

The potential advantages to the military services of this Third Party Financing concept may be stated as follows:

- o Avoidance of major capital investments which compete for available capital funds against projects more crucial to the military mission;

- o Avoidance of the need for personnel and operations and maintenance dollars to operate and maintain large, complex energy facilities;

- o Avoidance of responsibility for managing and administering large plants and systems, which allow management to focus attention on functions more closely related to the base mission;

- o Avoidance of technological risks while achieving participation in the efficiency and economic benefits of technological improvements;

- Participation in the energy cost savings achieved by applying efficient, modern technology to energy requirements;

- Reduction of energy price and supply vulnerability by having direct access to onsite or nearby energy production facilities; and

- Acquisition of energy-efficient improvements at a faster pace than is achievable through the military construction planning and construction system.

The advantage of the Third Party Financing concept to a potential investor or entrepreneur can be simply stated as, ". . . the opportunity for an attractive return on capital as well as other corporate interests (equipment sales, engineering and construction services, etc.)." In this regard, a number of facets to the concept appear to enhance the investor's chances of achieving an appropriate return on investment. Among these are:

- The availability of long-term and large, centralized thermal and electrical requirements with distribution systems in place,

- Favorable tax considerations such as Energy Tax Credits, Investment Tax Credits, and accelerated depreciation provided to encourage capital investments and alternate energy development;

- Efficiencies of alternate energy technologies and processes such as cogeneration;.

- Conditions favorable to the sale of cogenerated or independently produced power created by the Public Utility Regulatory Policies Act (PURPA) of 1978;

- Project revenue security provided by a long-term commitment from a stable energy customer such as the Federal Government; and

- Conditions favorable to the permitting and approving process when constructing energy production facilities on a Government-provided site.

The Third Party Financing concept for energy systems can provide measurable and significant benefits to both the military services and the private investment sector. Risks are involved, however, and it is necessary to define these risks and provide a mechanism to decide if they can be alleviated or limited or how they should be assumed.

While the advantages noted above refer to renewable energy sources or technologies, this is not to imply that Third Party Financing is not available, nor that it should not be pursued, as a vehicle for more conventional energy technologies such as coal. Rather, the list is intended to include references to those incentives which have been specifically provided for the use of renewable energy sources.

2. OBJECTIVE

The Air Force, perhaps more than the other services, depends on the security of its airbases for mission accomplishment. When the Navy goes to war, it takes its ships and airplanes to the combat zone. Likewise, the Army deploys its forces to the theater of operations. The Air Force, on the other hand, conducts its operations largely from established bases and these must be secure and capable of operating without interruption. A secure energy supply is especially critical to the accomplishment of the Air Force mission.

Accordingly, this study looks at the Third Party Financing concept for Air Force energy systems within the framework of system security and energy self-sufficiency. The approach will address:

- o Energy project structure;
- o Air Force Base operational requirements;
- o Management capabilities;
- o Potential crises that might substantially affect the availability of steam and power;
- o Crisis management options;
- o Overall risk assessment; and
- o Contract objectives.

3. SUMMARY

The study conclusions are summarized in six basic points:

- o Cogeneration application makes economic sense for many military installations based on the increased fuel efficiency of the simultaneous production of thermal and electrical energy. The Public Utility Regulatory Policies Act of 1978 (PURPA) allows qualifying cogenerators to sell their power back to the utilities at the utilities' avoided cost. Where favorable electric rates exist, this can reduce the incremental cost of thermal production to both the developer and the Air Force.

  Cogeneration also can offer increased installation energy security by providing onbase power generation capability to complement emergency diesel and gas-turbine generators, thus increasing the power available to meet crises.

- o Substantial financial and operational risks are inherent in the current methods of meeting installation energy requirements. Third Party Financing can be structured so that the operational risks of mission impact are less than now encountered. This can be accomplished by proper risk identification and confinement through specific contractual provisions.

- Substantial interest and capability exists within the private sector to finance, operate, and maintain energy installations for the military. This was demonstrated by the receipt of over 95 Phase I proposals to the State of California for 11 cogeneration projects.

  Additionally, major U.S. corporations such as General Electric, Ultrasystems, Foster-Wheeler, and Garrett-Wheelabrator Frye, have indicated specific interests and total capability to finance, design, construct, operate, and maintain energy generation facilities for Air Force installations. A specially tailored contracting framework may be necessary to attract these interests in order to ensure that the large bidding expenses necessitated (over $100,000) are incurred only by prequalified bidders.

- One of the most compelling reasons for Third Party Financing is not the design, construction, or operational savings offered by tax-assisted private developers, but rather the opportunity to undertake needed projects now. Many requirements will not be met in the near term without Third Party Financing from the private sector.

- To provide energy security for base operations and t increase the potential economic return of a project (by emphasizing capacity payments from the utility), cogeneration projects should be structured with an electrical emphasis and secondary thermal consideration. The fluctuating seasonal thermal loads encountered on most Air Force installations would be satisfied while maximizing project revenues.

- A shared approach to financial risks associated with long-term energy generation projects between the developer and the Air Force may offer the greatest return to the Air Force from both an operational and financial standpoint. An adversarial contract approach may be avoided by such arrangements as sharing in the pretax cash flow of a project. Both parties in this case share a mutuality of self- interest. Additionally, the Air Force avoids paying the developer to hedge worst-case financial risks.

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SECTION II

ENERGY PROJECT STRUCTURE

1. INTRODUCTION

"Third Party Financing" has been defined by the Air Force as any arrangement for energy services and/or benefits that does not require DOD funding. In the case of facility energy projects, Third Party Financing means capital investment for purposes of producing or saving energy, using other than Military Construction Program (MCP), Operations and Maintenance (O&M), Military Family Housing (MFH), or other commonly used USAF funding programs. Third Party Financing sources have included utility companies, municipalities, private sector companies or private investment firms.

The structure of such energy projects may take many forms. With 134 major Air Force installations, each requiring varying quantities of electrical and thermal energy and each having a particular set of operational and security requirements, there may well be 134 unique financing packages. Those factions of the private financial and development communities which are involved in a particular project will propose the structure of the project. The Air Force will necessarily participate in each step of the project development process, and it is therefore critical that the respective roles, perspectives, and responsibilities be understood.

The Energy Project Structure section addresses aspects of a facility energy project structure for Third Party Financing. Air Force base needs and requirements are discussed, as well as the role of available technologies in meeting these needs and requirements. The various project structures are examined and the Third Party Financing mechanisms to support these project structures are covered.

2. AIR FORCE INSTALLATION REQUIREMENTS

a. Energy

Traditionally, the Air Force has addressed its facility energy requirements for its bases in the United States by purchasing electricity from regulated utilities and by producing thermal energy in Air Force-owned and operated heating plants. Electricity is taken from an electrical distribution grid connecting into one or more substations on base. Emergency backup power requirements have been established by the base and are satisfied by diesel or gas turbine generators.

As onbase power demands increased over the years, new power requirements (for simulators, test equipment, computers, air conditioning, etc.) have been met through integration into the preplanned growth in capacity of the local utility.

Thermal requirements have been met quite differently. In most cases, Air Force installations own and operate their own thermal plants for the production and transmission of steam for heating, hot water, cooling, and process applications. Emergency backups exist only to the extent of equipment redundancy and under-capacity utilization.

Many Air Force steam plants are due for replacement. In 5 years, over 50 percent of the bases in the United States will be faced with thermal production facilities that are over 30 years old. The upgrading, replacement or addition of onbase thermal production facilities has been a part of the Military Construction Program. After many years of little or no funding for plant replacement, the Air Force military construction budget is currently providing funds for upgrading or construction of thermal plants on approximately three bases per year. While funding for such projects has improved, the total capital requirements will increase substantially over the next 5 years and pose significant financial challenges to the Military Construction Program. This competition for funds has resulted in the Air Force examining Third Party Financing options for new capital-intensive energy production facilities.

b. Energy Security

The Air Force depends on the constant availability of facility energy to accomplish its mission, especially for initial mission and mission-critical activities. The FY 1985-89 Defense Guidance requires that defense components program resources to, ". . . ensure energy security for key facilities."[1] Likewise, the first guideline of Air Force Facility Energy Policy is that:[2]

> Air Force installations should be energy self-sufficient to the greatest degree practical, particularly for critical mission requirements.

Further, one of the two conclusions of the recent tests of extended commercial power interruption at Minot AFB and Spangdahlem AFB was that, "an assured electrical power source is necessary to conduct the Air Force Mission." These tests demonstrated the dependence of sustained Air Force operations on uninterrupted facility energy. Energy self-sufficiency is an incomplete goal without considering energy security as an adjunct. The value of having a power source located within the perimeter of an Air Force installation should be seen in this light.

The reliability of the various energy sources should also be as survivable as the installations and operations that they serve. Hence, an onbase cogeneration plant may not qualify as a backup source of power to a missile field or a control center, but would be an appropriate backup source for a supply depot.

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[1] Page 98, Section F.2., Chapter 5, "Resources Planning Guidance," Draft FY 1985-89 Defense Guidance. Signed 1 Mar 83 by Secretary of Defense.

[2] Letter, Office of the Chief of Staff, Department of the Air Force, dated 20 Oct 1983, subject: Facility Energy Policy.

c. Contracting

(1) Source Energy

Potential sources of energy, in addition to oil, coal, and natural gas, include geothermal, nuclear, biomass, wind, and solar. [illegible] the latter three, private sector financing methods may be particularly attractive due to special tax incentives available. The Air Force exerts no influence over the source of the electricity supplied by the local utility, while onbase steam plants use coal, natural gas, and oil, with coal being preferentially employed in new or converted plants. The Air Force is moving toward dual or multifuel capability in their plants which will reduce the criticality of a shortage or curtailment of a particular source energy.

Two basic assumptions underlie any discussion of Third Party Financing. First, that the private sector will make a profit. Second, that the Air Force will improve its net position through the arrangement. Certain sources of energy will test these assumptions more than others because of uncertainty of supply availability and price through the life of the facility. Thus, consideration should be given to locally-abundant energy supply sources, as well as alternate fuels supply. Final project development is highly dependent on local resource price and availability. The underlying objective is the provision of reliable energy supply at a net cost to the Air Force equal to or less than the projected costs of the present contracting method.

(2) Security of Source Energy

In the event of national emergencies, the Defense Production Act of 1950 (DPA) provides the authority for the Federal government to allocate petroleum for defense purposes. However, it does not provide protection for defense contractors and suppliers. Thus, private electric and thermal energy suppliers, using fossil fuels, would be subject to potential energy supply disruptions.

The Interdepartmental Task Force, formed to improve procedures for allocating petroleum during emergencies, may consider supply allocation to independent producers of electrical and thermal energy at critical defense installations. Alternately, the sale of DOD energy supplies to these contractors might be necessitated. The Defense Fuel Supply Center (DFSC) or Air Force installation might sell independent energy contractors fuel from military reserves under circumstances where installation energy [illegible] were threatened on a localized or national basis.

d. Operations

The Air Force must be assured that the energy plant will [illegible] down by disturbance or other work stoppages. Formal recognition of [illegible] operation and management procedures should be included in the power [illegible] contract, and should include provisions for Air Force takeover [illegible]. Accordingly, provisions should be made for cross-training Air Force personnel in key operational positions to cover such contingencies. This might be [illegible] using local Air Force reserve personnel who would then be called up to run the generation facility during emergency situations. Alternatively, [illegible] Force civilian personnel [illegible] ational requirements, leaving maintenance responsibilities and management direction to the developer.

3. EFFECT OF TECHNOLOGY

The presence of centralized thermal requirements on Air Force installations co-located with large electrical demands presents considerable potential for cogeneration. The passage and implementation of PURPA has facilitated the sale of electricity generated while meeting Air Force thermal demands to local utilities. Cogeneration offers the additional advantage of providing dedicated backup power to a base during periods of utility grid outage. Backup power capability must be specifically addressed as part of the energy contract negotiation. The additional cost of this electrical power generation capability must be compared to the costs of additional backup power capability provided by diesel engine or gas-turbine generators. If capital equipment costs are allocated against the electrical generation capacity, the operational costs of generation can be compared to current electrical charges. The electricity generated during installation minimum thermal demands can be compared to the avoided costs of the highest purchased-power costs.

Although current technology affords a developer the opportunity to combine the facility energy requirements of electricity and heat as well as their related backup requirements, the contractor's capability to cope with start-up problems, equipment failures, and maintenance requirements must be carefully reviewed. These should be explicitly dealt with in the contracting process, and reflected in both contract language and requisite completion and performance bonds.

4. THIRD PARTY FINANCING MECHANISM

The specific financial structure used by third-party energy producers depends on an interrelated series of factors including:

- The ownership, tax, and regulatory status of the proposed facility;
- The security provisions for the debt;
- The type and ownership of the fuel resource to be converted into electricity and/or thermal energy (and, in some instances, even the conversion process); and
- The location of the energy production facility and the relevant jurisdictional and regulatory control over both the business and contractual arrangements between the military and the energy production business.

a. Ownership, Tax, and Regulatory Status of Proposed Facility

The ownership, tax, and regulatory status of the proposed facility has an obvious impact on the types of financing structures which can be legally and profitably employed. Municipal, district, state, and Federal electric utilities operate as tax-exempt entities. Their primary sources of capital financing are through the issuance of tax-free bonds or direct budget allocations. Since these utilities are nontaxable businesses, they themselves cannot take advantage of investment or energy credits against income taxes due. But because many of these utilities can offer tax-exempt bonds, their cost of debt is less than that available to taxable businesses. One of the first project trade-off analyses is the availability and value of tax credits and associated benefits versus the differential in cost of [illegible] and tax-exempt debt.

In a project structured between a military base and a regulated utility to provide onsite electrical generation, the project becomes subject to rate regulation as though the plant were an addition to the utility's generating capacity and rate base. In many states, however, steam sales (resulting from cogeneration applications or direct-steam projects) are not regulated and these projects may be accorded special status. In the contractual arrangements between the Navy and Applied Energy, Inc. (a wholly owned subsidiary of San Diego Gas and Electric), the electric and steam production businesses were legally separated by SDG&E (at the request of the Navy) so that steam sales to the Navy would be unregulated. Both the steam rates and contract terms were negotiated privately, avoiding the possibility of intervention by the Public Utilities Commission.

Private ownership of energy-production equipment and the plant allows the most latitude in creating a financial structure. Whereas the energy tax credits and special depreciation treatments are not available for qualified energy property owned by a public utility, qualified privately owned energy property is accorded both benefits. Private developers can use a variety of mechanisms to secure the equity that comprises 20-40 percent of most projects. Joint ventures or limited partnerships, offered through public or private placements, are but two of the most common structures. The debt portion of the project may be secured through conventional bank loans (with loan guarantees available for particular technologies) or through issuance of tax-exempt municipal bonds for exempt facility categories. A number of concise treatises deal specifically with project and special financing.

b. Financial Security

Energy project borrowings may be secured by two basic approaches -- the overall creditworthiness of the project owner (i.e., the "deep pocket" of a third party, utility, municipality, or even the full faith and credit of the Federal Government) or the projected revenues of the project itself (a true "project financing"). In the first instance, the Air Force might be asked to guarantee a portion of the debt financing (possibly in return for lower energy prices). However, most energy projects which have been accorded thorough feasibility review and appear economically viable can and should be financed on a self-supporting basis. That is to say the projected revenues of the project from the sale of thermal and/or electric energy and the [illegible] facilities themselves provide necessary and sufficient security [illegible] The latter instance does not rely on either capital or operating [illegible] budgets and, as such, is the more desirable option.

c. Ownership and Type of Energy Resource

Federal tax law makes credits available [illegible] types of energy production property, in addition [illegible]
[illegible]

in Table 2. While the structure of the project will determine the ownership and therefore applicability of the tax benefits, the type of combustion equipment and subsystems chosen for fuel handling, environmental control, energy distribution, and waste disposal will determine the amount on which the credit is based.

TABLE 2. RENEWABLE ENERGY TAX CREDIT RATES

(Business Energy Investment Tax Credit)

Classification	Expiration Date		Credit Rate*		Affirmative Commitments***	
	Current	Proposed	Current	Proposed	Current	Proposed
Solar	1985	1990	15%	25%	No	Through 1995
Wind	1985	1990	15%	25%	No	Through 1995
Geothermal	1985	1990	15%	25%	No	Through 1995
Small Hydro	1985	1990	11%	15%	Through 1988	Through 1995
Biomass						
Presently Covered Biomass	1985	1990	10%	10%	No	Through 1995
Other Biomass**	1982	1990	10%	10%	Through 1990	Through 1995
Cogeneration	1982	1990	10%	10%	Through 1990	Through 1995

* Does not include basic 10% investment tax credit.
** Other Biomass: Oil- and Gas-Fired Alcohol Fuels; Biomass Recycling; Biomass Gasification.
*** Expiration date may be extended if certain conditions are met.

Property <u>owned by</u> or <u>leased to</u> a branch of the Federal Government does not qualify for tax credits. Furthermore, as stated previously, public utility property does not qualify for the energy tax credit. Therefore, maximum tax advantage can be taken by unregulated private developers who use qualified energy property in a business which produces and sells electrical or thermal energy to the military user. Fossil fuels can also be used in cogeneration applications which offer a combined-cycle efficiency greater than if electricity and thermal energy were generated separately. Although energy tax credits are not currently available for new cogeneration projects using coal and natural gas, the increased cycle efficiency and secondary revenue stream often support economical applications when the steam and electricity load profiles are closely matched.

There are three major energy resource ownership patterns: military, municipal, and private. Military bases may own a number of indigenous energy resources which might be developed including geothermal, biomass, coal, and natural gas. The unique municipal energy resources include biomass (methane) from landfills and municipal solid waste. Private resources are owned or may be secured, collected, or purchased on a long-term contract basis. Examples include wood waste, coal, and natural gas.

Where military resource ownership exists, access to the [illegible] resource must be negotiated and contracted using some arrangement which does not jeopardize the ability to use any applicable tax credits. Municipal resource ownership may argue for bond issuance and an ownership position through the creation of a municipal utility. Alternatively, the resource may be made available to a private party so that tax benefits can be realized. One attractive option is to issue tax-exempt industrial revenue bonds (for exempt project categories, including waste-to-energy conversion) for the debt in combination with equity provided by the project sponsor. The energy tax credit is not available on the fraction of property financed through tax-exempt bonds, however. The merits of the particular project structure will be determined by the impacts of regulation and trade-offs between tax-exempt debt resources and income tax credits associated with taxable project treatment.

As a user with relatively stable energy demands, military bases can offer long-term purchase contracts to energy suppliers. For all potential developers, this long-term stability (the customer as well as the energy demand) represents one of the most significant attractions in structuring a project with the military. The importance is magnified, however, for private developers who use project financing and municipal utilities who issue Industrial Revenue Bonds. Before any developers can secure equity commitments, firm power purchase agreements (contracts) must be executed. In making a long-term commitment before the actual delivery of energy, the military must therefore assess the project developer's capabilities, financial strength, and track record. Power Purchase Agreements and underlying project construction contracts should include the protection afforded by firm fixed-prices, guaranteed-schedule, and performance guarantees backed by bond instruments. These criteria will discourage proposals by developers who do not have the requisite experience and capability to successfully complete the project.

5. EXAMPLES OF SUCCESSFUL JOINT VENTURES AND ALTERNATIVE-FINANCING PATTERNS

a. Existing Military Experience

Several examples of successful Third Party Financed [illegible] found within the military and other government sectors. The [illegible] the most experience with projects including utility-owned cogeneration at the San Diego Naval installations, independent contract [illegible] development of geothermal resources at China Lake Naval Weapons Center, and long-term refuse derived fuel (RDF) contracts with a regional waste [illegible] at the Norfolk Naval Shipyard. Additional projects are planned by the [illegible]

Army is considering the purchase of steam from a solid- waste-burning plant at Aberdeen Proving Ground, to be constructed by the local refuse authority.

The Air Force has two RDF projects with local utilities (Griffiss AFB and Pease AFB) under which local utilities will construct heat recovery incinerators and sell steam to the Air Force. A solar hot water-heating system for the Air Force Academy is in the planning stage, as is a project at McClellan AFB where the local utility will own, build, and operate a gas-turbine peaking electric power plant on base. Other alternatively financed projects using wind (Travis AFB) and geothermal (Williams AFB) have been abandoned for lack of sufficient contractor interest in these projects.

b. Description of the Current Level of Interest

A demonstration of the level of interest in Third Party Financing can be seen in the list of parties responding to a request for proposals from the State of California for eleven cogeneration projects for selected hospital, prison, and university facilities. There were 451 responses. While not all of the 451 parties were interested in submitting bids as general contractors, they had related interests like financing, managing, or providing equipment or services to such projects. The State of California finally received 95 Phase I proposals for these cogeneration facilities from which it qualified 15 for final proposals under the second and final phase of its alternatively financed cogeneration procurement process. Many of these facilities (especially hospitals and prisons) have continuity, contingency, and security requirements similar to Air Force installations. The finalists selected to date have all been joint venture parties composed of several companies brought together specifically for these cogeneration projects. California envisions a return of up to $750 million to the state (over 20 years) on the private sector investment of $180 million.

It should also be noted that the Third Party Financing decision on these California projects was not based upon least life-cycle costs, but rather as, ". . . a practical way to expedite project development and relieve some of the funding burden from the State budget." It was, however, more economical to the State to seek Third Party Financing of these projects now and begin to acquire the associated savings than to postpone these projects until they could be funded internally.

SECTION III

AIR FORCE BASE OPERATIONAL REQUIREMENTS

1. INTRODUCTION

The Air Force spent $940 million (FY83) to provide electrical and thermal energy to meet its installation energy requirements. Over half of this energy (57 percent - Table 3) is in the form of electricity. Since 1975, the Air Force has reduced its consumption of energy in its installation operation by approximately 15.3 percent; however, with the continued increase in space conditioning for comfort as well as operations (i.e., computer facilities) and an increase in installed electrical equipment (i.e., simulators), electricity has increased as a percentage of the overall requirement. In this section, energy consumption profiles of individual Air Force bases are shown. These bases were selected to represent a range of climatological as well as operational command factors that typify Air Force installation operations in the contiguous 48 states.

The location of these bases, as well as those of all other major Air Force installations in the United States, is shown in Figure 1.

TABLE 3. FISCAL YEAR 1983 ENERGY CONSUMPTION FOR AIR FORCE INSTALLATION OPERATIONS BY FUEL TYPE

	Usage* Trillion Btu (%)	Costs Million $ (%)
Electricity	108.5 (58)	$494.3 (53)
Fuel oil	29.1 (15)	236.5 (25)
Natural gas	37.4 (20)	169.6 (18)
Propane	0.2 (.1)	2.0 (.2)
Coal	12.2 (6)	33.2 (4)
Purchased steam	0.7 (.3)	4.8 (.5)
Renewables	0.2	
	188.3	$939.6

* Conversion factors:

Electricity	-	11,600 Btu/kWh
Natural gas	-	1,031 Btu/cubic foot
Propane	-	95,500 Btu/gallon
Coal	-	24,580,000 Btu/short ton
Purchased steam	-	1,390 Btu/pound

2. ENERGY CHARACTERISTICS OF AIR FORCE INSTALLATIONS

As shown in the accompanying charts, Air Force installations are sensitive not only to their geographical region, but also to the base mission. In comparison, Tyndall AFB (TAC) Florida peaks at 120 x 10^3 MBtu's in June, and Hill AFB (AFLC) Utah peaks at 450 x 10^3 MBtu's in January. While electrical consumption on bases with central heat plants does not appear to fluctuate

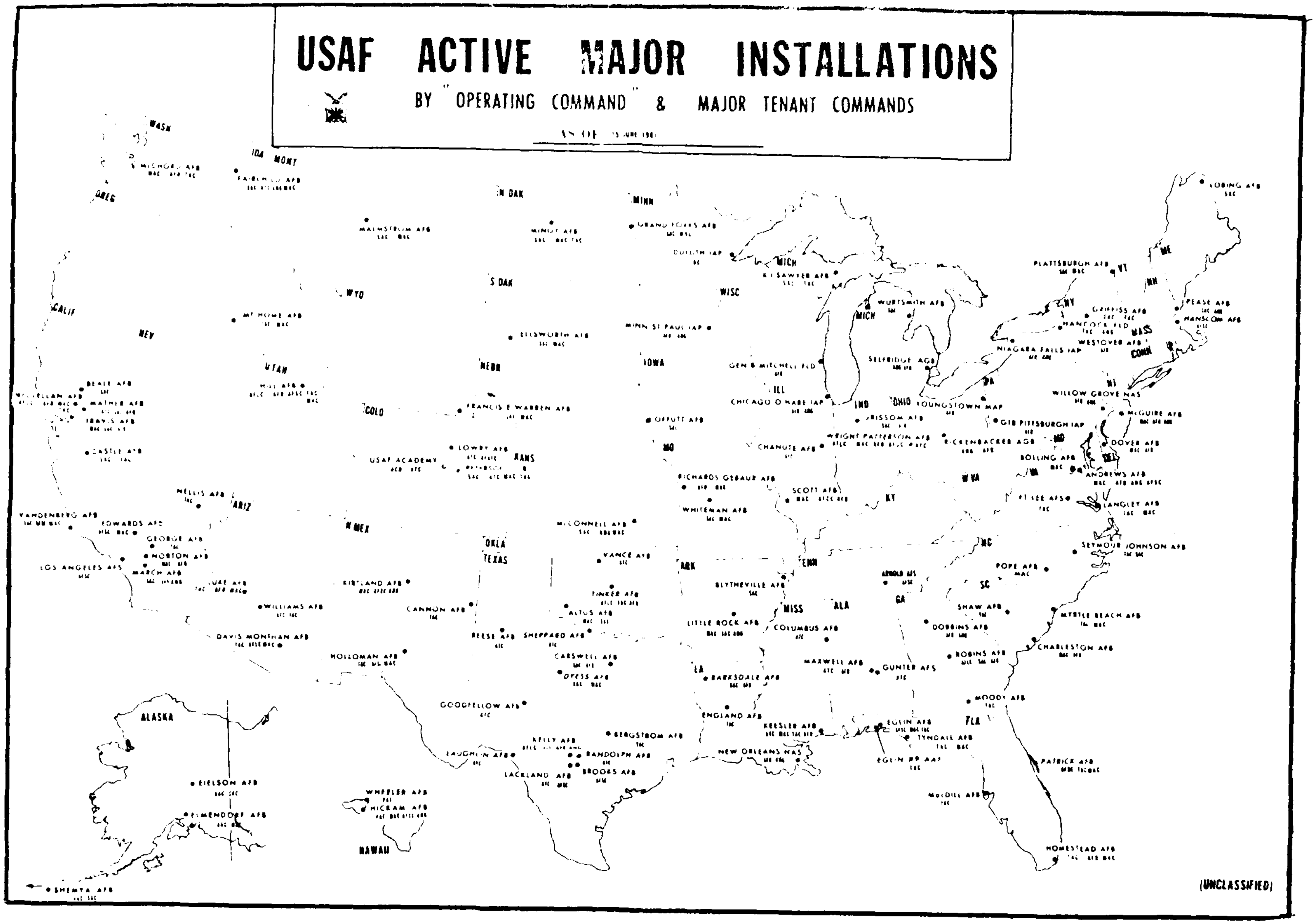


Figure 1. USAF Active Major Installations

widely by month, consumption can fluctuate daily by a factor of 50 percent or more. This makes Air Force installations very sensitive to peak-demand charges. These charges account for approximately 30 percent of the total cost of electrical energy to the Air Force, but in some utility service territories may exceed 50 percent of the total bill.

As the U.S. economy resumes its growth, total electrical demand will grow accordingly, thus reducing utility reserve margins in many parts of the country. As this occurs, it can be anticipated that the demand charges will continue to grow. Cogenerated power on Air Force installations may then become more important as a means of reducing utility peak-capacity charges. Thus, while maintaining grid connections, Air Force installations could reduce their grid-capacity requirements to a level below peak demand, relying on cogenerated power instead. In practice, this power may continue to be sold to the grid by a third-party with a negotiated capacity charge reduction for peak power requirements. This assumes a utility negotiated capacity payment to the cogenerator that carries a reliability commitment with it.

The total base energy requirements can vary from summer to winter extremes by 100 percent or more (e.g., Minot AFB). This poses a sizing problem to potential cogenerators, especially in view of the Federal Energy Regulatory Commission (FERC) requirement for a 42.5 percent thermal efficiency for qualified cogenerators under PURPA. This efficiency factor is calculated as the electrical output plus one-half the useful thermal output matched against the lower heating value of the fuel input. This might pose difficulties for plants designed primarily for thermal loads with secondary electrical output. Thus, in most instances, it appears advantageous to size a cogeneration plant for anticipated electrical requirements with secondary item usage for fluctuating thermal requirements. This will also allow the cogenerator to negotiate capacity as well as demand fees from the local utility and provide a much greater supply of emergency- dedicated power. Cogeneration can offer 15-45 percent more fuel efficiency when compared to conventional power and heating sources. While not directly tied to Air Force energy conservation goals, this increased efficiency should reduce the escalation in costs of Air Force installation energy.

Current emergency generation capacity is authorized for selected facilities and uses as shown in Table 4. The Hill AFB chart demonstrates that this authorization only covers about 16 percent of peak operational requirements for electrical energy. The Tests at Spangdahlem AB and Minot AFB, as well as the Hill AFB commercial power outage have demonstrated a need to reexamine mission-critical electrical requirements and the potential value of increased electrical backup capability. All of the above suggests strong consideration of full electrical cogeneration capacity at key Air Force installations where economically justified. This should be based on the cumulative effect of:

- Utility-avoided costs
- Anticipated peak power charges
- Projected electrical demand expenses
- Projected new and replacement backup power costs

TABLE 4. FACILITIES AUTHORIZED EMERGENCY ELECTRICAL POWER

Backup generators are provided to support essential functions on Air Force bases in accordance with DOD instructions (Manual 4270.1) and Air Force Regulations (AFR 91-4). Facilities which may be provided with emergency power are listed below:

- Hospitals
- Navigation aids
- Refrigerated storage
- POL storage and dispersing
- Critical utility plants
- CE control centers
- Communications facilities
- Fire stations and alarm systems
- Critical computer facilities
- Control towers
- Base weather stations
- Surveillance and warning facilities
- Command and control facilities
- Weapon systems
- Security lighting systems
- Aircraft and aircrew alert facilities
- Law enforcement and security facilities
- Disaster preparedness centers
- Remote sites
- One feeding facility per base
- Critical readiness facilities
- Essential photo laboratory

3. CONSUMPTION PROFILE BY INSTALLATION TYPE

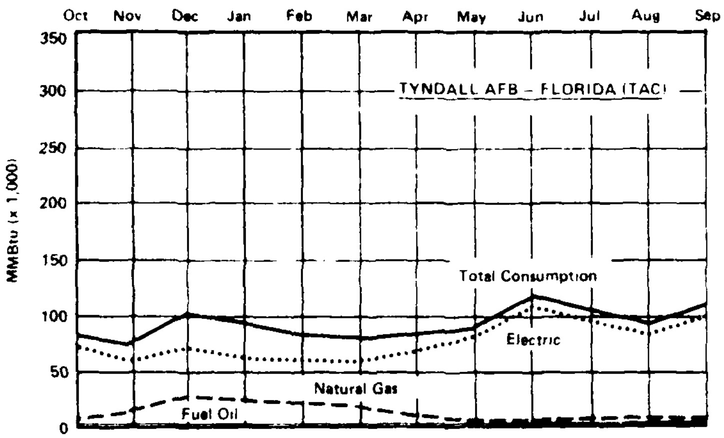
Energy consumption profiles for five Air Force installations show the differences in energy type usage as well as the effects of geographical location. As each Air Force Base has a unique set of requirements, any Third Party Financing program should approach facility sizing only after thoughtful discussions with base energy personnel.

The bases were selected as representative of the Air Force major commands. The bases are:

- o Tyndall AFB, Florida - Tactical Air Command
- o Travis AFB, California - Military Airlift Command
- o Minot AFB, North Dakota - Strategic Air Command
- o Chanute AFB, Illinois - Air Training Command
- o Hill AFB, Utah - Air Logistics Command

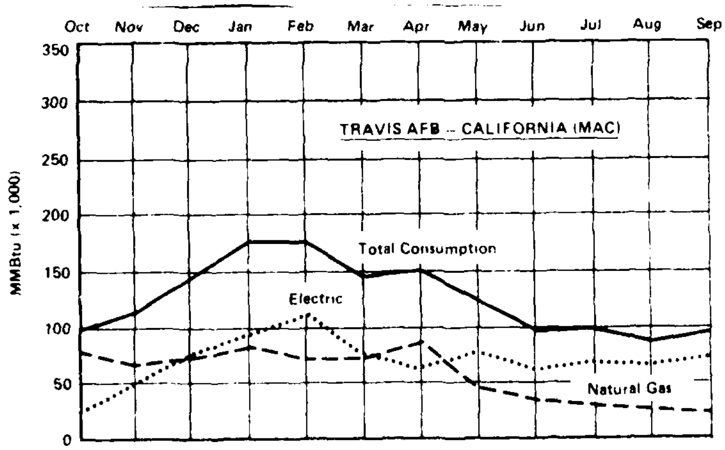
a. Tyndall AFB

Tyndall AFB, Florida, was chosen to represent a Tactical Air Command base and typify the energy load of a southeastern U.S. installation. It also is the home of the Air Force Engineering and Services Center which serves as the focal point for installation energy initiatives within the Air Force. The predominant energy commodity of Tyndall is electricity. The base has a relatively level consumption pattern for the year.



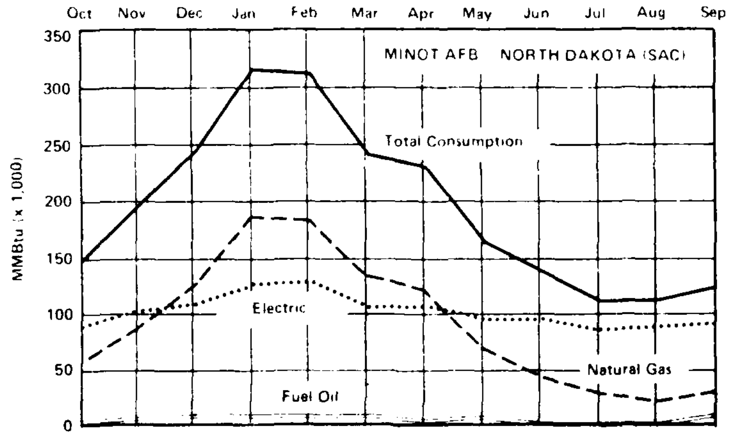
b. Travis AFB

Travis AFB, California, was chosen to be representative of a Military Airlift Command installation. Its location in the Sacramento, California area typifies to some degree the mild semi-arid climate of many of the southwestern U.S. bases. The electric consumption profile for Travis is relatively consistent for the year indicating a favorable situation for base load cogeneration with supplemental thermal energy in the winter months.



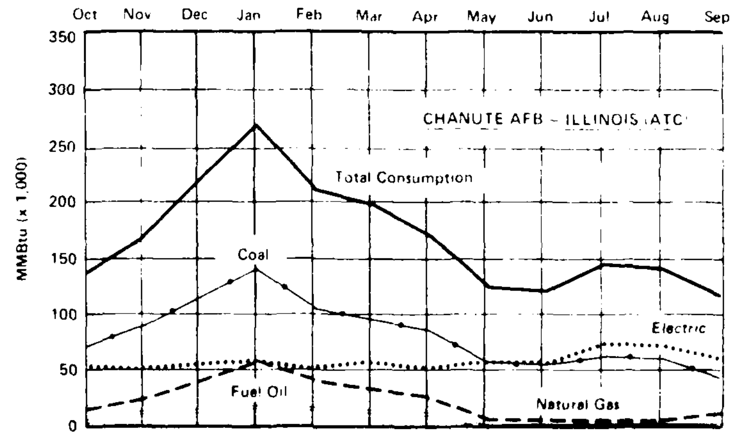
c. Minot AFB

Minot AFB, North Dakota, was selected to typify the energy profile of the northern tier Strategic Air Command installations within the U.S. It also is one of the few bases that is home to both a bomber and missile wing. In August 1981, a test of mission capability without commercial power was conducted and it clearly demonstrated the need for an expanded definition of mission critical facilities and the need for a base energy self-sufficiency. The Minot profile shows relatively level electrical consumption with a fluctuating thermal requirement peaking in the winter. As with Travis, these conditions are favorable to base load cogeneration with supplemental thermal energy. Alternatively, depending upon the local utility avoided cost structure, it may be possible to structure a good project with excess electrical production (at a level rate) such that peak thermal requirements can be met.



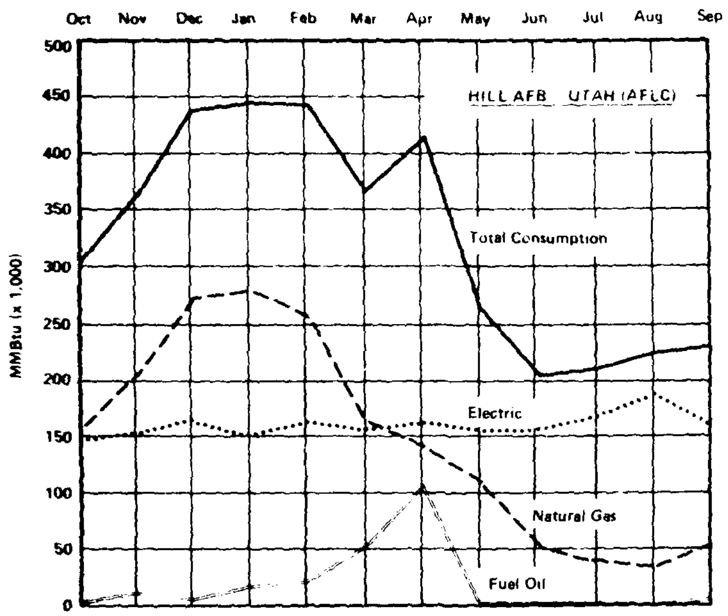
d. Chanute AFB

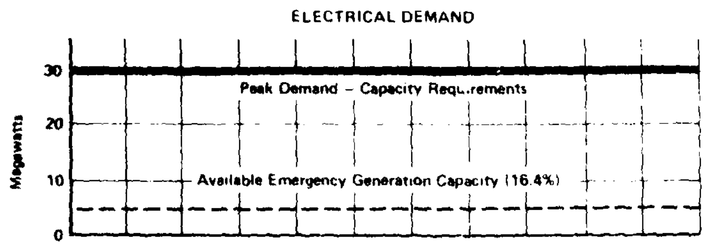
Chanute AFB, Illinois, was chosen as a typical Air Training Command installation. It also has a substantial coal usage and has been the subject of congressional attention in terms of upgrading that facility.



e. Hill AFB

Hill AFB, Utah, experienced a prolonged outage of commercial power in January 1981, due to a trip overload. This unplanned outage demonstrated the substantial impact on mission effectiveness of a Logistics Command base due to a loss of commercial power. Logistics Command installations characteristically represent the large energy load associated with the rework production necessary to maintain effectiveness in the field.





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SECTION IV

MANAGEMENT CAPABILITIES

1. INTRODUCTION

One of the largest underlying concerns of the military in regard to alternatively-financed projects is the potential impact resulting from a "loss of control." However, these projects can be structured so that the military assumes an even greater degree of control over the risks associated with facility energy generation while giving up only operational responsibilities.

It should be recognized that the military has only "controlled" two of the three facility energy elements (thermal, electrical, and backup electrical). Rarely does the military control the source of its primary electrical power. Further, its ability to operationally sustain its current backup diesel/gas turbine generation capability may be limited. Also, its ability to function with a major thermal generation loss has not been tested.

2. UTILITY MANAGEMENT CAPABILITIES

The major advantage in central utility management is the interconnection and duplication of generation and transmission. A loss of output from any particular plant is overcome by the excess capacity in other plants within the system and major grid interconnections between systems. While the United States currently enjoys a 20% excess electrical generation capacity, a recent study by EPRI (Electric Power Research Institute) reveals that approximately 12% of the total over capacity is unavailable due to unplanned outages (7% forced outages and 5% partial outages). An additional 5% is out due to planned maintenance activities. Thus, generation failures from any cause are generally covered through the remaining 3% surplus capacity utilization, rescheduling of maintenance activities, purchased power from other utilities, and occasionally load shedding and forced load reductions for major industrial customers.

In the case of labor strikes at power production facilities, other plants and overall system capacity is used to compensate. The size of the management staff also permits their being substituted for critical labor requirements on a temporary basis. Fuel is generally obtained on long-term (5-year) contracts. Disruptions in tne fuel supply network are overcome by maintaining, in many cases, fuel stocks of 90 days or more. Recently, electrical utiiities have located their new generation facilities at the source of fuel (for coal at the minemouth). A mix of fuel sources not only decreases the physical but also the financial dependence on one fuel type.

3. NON-DEFENSE CRITICAL FACILITIES

Hospitals must maintain power at all times to avoid life-threatening situations as well as thermal generation capabilities to maintain ongoing operations. Thus, they maintain a standby generation capability, usually with diesel generators, capable of meeting their entire load. In Veterans Administration hospitals, 3-4 days of fuel supply is also on hand for contingency operations.

To provide redundancy for thermal generation excess boiler capacity is designed into the facilities (i.e., 3 boilers for a 2-boiler requirement), thus permitting maintenance as well as unanticipated operational problems on a single unit to be overcome without output degradation. Additional vulnerable elements of the system (such as feedwater and condensate transfer pumps) are duplicated to compensate for potential failure.

Within the private sector, major companies that require continual operations rely on equipment redundancy such as a spare boiler, and replacement generation equipment such as emergency turbine generators, as major components of their contingency plans. Power transmission feeds are frequently duplicated into one facility from two different directions to provide an alternative in the case of a specific line or general failure in one segment of a utility distribution system. In the case of internal labor disturbances, management is usually capable of operating the essential utility services as needed. Other measures taken include the provision of fuel switching capability, considerable on-site fuel storage and, in some cases, company-owned alternative fuel transports to overcome logistical problems. As stated by Mr. Robert Stedes, Director Energy Supply for PPG Industries, "If one key is more important than others, it is flexibility." Flexibility is achieved by the planned contingent provision of alternatives, from fuel supply and transport to generation equipment and distribution capabilities. Other companies, such as 3M, also develop contingency plans for supply disruptions of fossil fuels as well as detailed electrical power curtailment plans for individual facilities. It is interesting to note that the latter is based not on specific emergency operations, but on the possibility of a power company request for power curtailment due to shortages in localized power generation facilities. This is certainly a contingency that should be addressed by the Air Force.

4. CURRENT DEFENSE EXPERIENCE

The military has little "control" over the electrical utilities from which they obtain power. Control is only exercised in terms of provision and use of emergency power generators as described in AFM 88-15. Facilities that may be provided with emergency generators are outlined in AFR 91-4 (see Section III-3). Recent operational tests without commercial power have indicated a need to review and expand these mission-critical generation requirements. Additionally, current personnel deployment plans during a conflict may not leave base installations with sufficient trained personnel to maintain emergency generation capabilities.

The thermal production facilities on most installations are the responsibility of the Base Civil Engineer. Staffed by a combination of military and civilian personnel, these facilities operate independently and are financed as cost items within the budget. The financial risks (such as fuel cost escalation or equipment failure) are not avoided, but merely absorbed. Operational risks are covered by excess capacity design and equipment redundancy. With alternatively-financed projects, the Navy has maintained the right to assume operational control of a facility if the required output is not obtained for a period of four hours or more duration. Only to the extent of poor system performance and reliability is an alternatively-financed system "less controllable" (within four hours) when compared to the traditional energy systems on a military facility. As previously stated, those risks are ameliorated by the engineering review process demanded by all major financial institutions during the design of the plant, construction and performance bonds by the developer, and a power purchase contract pricing mechanism which rewards reliability and performance.

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SECTION V

POTENTIAL CRISES

1. INTRODUCTION

Identification of potential problem areas and related contingency plans should form an essential part of any service contract for a military installation. As has been pointed out in the introduction (Section I) to this report the Air Force is especially vulnerable to unplanned disruption or curtailment of services to their air bases. This is especially true for electricity and thermal energy supplies. Each power and/or thermal facility has three basic elements which should be covered in this regard: fuel supply, generating capability, and distribution. In all three cases, the degree of contingency provision should be viewed against the real and perceived risks. Guidance concerning energy supply assurance is contained in the FY 1985-89 Defense Guidance where energy supply assurance is identified as a Defense Department energy priority.

2. HISTORICAL DATA

As demonstrated inadvertently at Hill AFB in 1981 and during tests at Minot AFB and Spangdahlum Air Base during 1982, current power and thermal resources carry significant risks of mission impact that can be associated with unplanned outages. From a utility standpoint, the greatest vulnerability is one of distribution, not generation. This was demonstrated on a large scale during the 1965 Northeast blackout affecting 13 million people up to 13 hours and the famous New York blackout in 1977 which lasted up to 27 hours. Looped distribution as well as grid interconnections are two means that are employed to overcome these potential problems.

3. POTENTIAL CRISES

a. Labor Instability

Supplier labor presents not only a security issue, but also represents a potential source of unreliability. While many of the "third party" contracts written to date with the military do not hold the contractor liable for strikes, they do make provision for government intervention and operation after a designated period without provision of emergency service (i.e., San Diego = 4 hours). Obviously the size of the plant, the technology utilized and the source of operation management can significantly alter the degree of risk posed by potential labor instability. The labor requirements of different technologies vary from 40-60 people for a 40 Mw coal-fired generating plant down to one operation person or less for a 40 Mw gas turbine peaking plant. Use of government personnel to run third-party operations in emergencies has been contractually recognized. However, formal cross training of personnel has not usually been established. For conventional systems, this might not pose a large problem, but for more exotic technologies, such as geothermal or solar, trained personnel may not be available without such provision. During periods of deployment, adequate local military personnel capable of operating a facility may not be available, especially for labor intensive technologies. Thus, highly sophisticated, unconventional labor intensive technologies pose the greatest risk from a personnel standpoint.

Finally, large utilities or similar companies with multiple locations pose less risk due to the size of their labor and management pool. The latter also reduces the operational dependence on a few individuals.

b. Fuel Supply Shortage

Fuel supply is integral to the operation of any energy supplier. Traditionally, the Air Force has relied on the fuel stocks of the major utilities for its electrical and gas energy and on DFSC as the primary source of its coal and fuel oil supplies. Both of these sources maintain sufficient stocks and have multiple locations to weather supply disruptions for a considerable period of time. However, "third party" operations open up the possibility of limited access to these sources and, thus, are potentially more vulnerable. In cases involving local energy supplies (solar, wind, geothermal, and biomass in some cases) along with intensive energy supply technologies (such as nuclear), there is less risk of fuel supply shortages. In alternatively-financed projects, contractual consideration should be given to: 1) the size of local fuel stocks maintained by the supplier; 2) the strength of the supplier's fuel contract; 3) alternate fuel utilization capability; and 4) access provision to Defense (DFSC) or base fuel supplies.

c. Equipment Failure

Electric utilities cover the possibilities of unscheduled equipment outages affecting output by maintaining a surplus capacity designed to be at least 20% of the total system capacity. Individual base thermal requirements are rarely met by a single boiler. Most Air Force installations have several boilers, permitting continued full operations despite individual equipment failure, as well as easily accommodating scheduled down times for maintenance. The requirement for equipment redundancy or supply interconnection with other sources should be measured against the potential effects of supply loss. A thirty-percent loss in steam might be accommodated by shutting off, temporarily, some non-critical facilities or proportionally reducing thermal requirements.

Formal provision of emergency services should be recognized. For security and management purposes, these most likely will be provided by the Air Force installation. These services range from fire protection (per AFR 92-1) to emergency medical coverage of supplier personnel (AFR-168-6). Contractual recognition of appropriate payments should be recognized as well as the requirements for interconnection and maintenance of the appropriate alarm systems.

d. Fire

The threat of fire is perhaps greatest in the fuel-handling and storage areas. Requirements in this area should be contractually set forth. In addition to fire suppression systems within generation plants, consideration should be made of fire wall separation between redundant parts of the system to contain capacity losses. Further, to ensure quick response and adequate security, base fire protection (per AFR 92-1) should be extended to non-Air Force energy generation facilities that are located on Air Force installations. To accomplish this, connection to base fire alarm systems must be made, as well as adequate training of base fire-fighting personnel and developer operational personnel.

e. Physical Security

Physical security is always a matter of concern for base installations. Incoming electrical power is as vulnerable as the one or more incoming power transmission lines. Thermal plants at the perimeter of a base may be more vulnerable to sabotage or terrorism than one in the center. However, "third party" facilities meeting Air Force security requirements and connected to Air Force security alarm systems are probably less vulnerable than those located outside the umbrella of surveillance and quick response by Air Force security personnel. Again, to the extent that "third party" operations make the base more self-sufficient, they reduce the vulnerability of an Air Force installation to energy supply disruptions.

f. Financial Insolvency or Unprofitability

An inherent risk associated with alternatively-financed power and thermal generation plants is that of financial insolvency or unprofitability of the "third party" operation to the extent that it threatens proper facility maintenance and operation. This would most likely occur when the "third party" is formed as an investment vehicle only for this purpose and has no other backing. Its singular motivation would be profit, both from tax benefits and operations. This, however, would not be the case of corporations with a major portion of their investment returned as long-term operating profits or major utilities which are open to public scrutiny for their franchise. This should not be taken as an indictment of the entrepreneur, but rather consideration should be made of the "third party" financial backing.

g. Acts of God

Acts of God, such as earthquakes, tornadoes, and hurricanes are equally likely to strike "third party," base, or utility generation facilities. However, in the case of electricity, "third party" cogenerators potentially offer the Air Force an additional dedicated supply of backup power. This, combined with redundant on-base distribution systems (looped primary and primary selective distribution), can significantly reduce the effect of these Acts of God. In terms of thermal generation, "third party" operation of on-base facilities would be mostly affected by the relative ability of operating personnel to report to work.

h. Military Conflict

Military conflict or the threat of it poses some risk that the civilian population might leave. To a lesser degree, this would be true of Air Force civilian personnel as well. However, in the case of military deployment, base plant operations might also be caught short without adequate civilian personnel. To the extent that the technology employed depends on labor, there is some risk. Third-party cogenerators might require considerably fewer people during extended outages than the operational requirements for independent remote generators delivering the same amount of power.

i. Contract Dispute

Procedures for contractual disputes have been well established. Unless they influence operation, they should not pose a major management crisis. Failure to deliver unless under force majeure has already been established in other "third party" contracts as grounds for government intervention.

j. Base Closure

There is always an inherent risk that a change in Air Force mission requirements could significantly alter installation energy requirements. These changes, before incurred, should be recognized and weighed against their potential costs. In the case of "third party" contracts, there could be substantial cancellation penalties during the early years of the contract. The size of cancellation liabilities will vary with contract length and the percentage completion. The private sector users have shied away from energy supply contracts in excess of 10 years, not feeling comfortable with economic production plant life projections of greater length. However, in 1982, Title 10 of United States Code was modified by Section 2394 to allow the Services to contract for energy for periods up to 30 years. If employed, this provision enables a developer to use term financing (especially bonds) which translate into lower unit costs for energy to the Air Force. In practice, large investments will usually require long term supply contracts in order to be economically viable.

SECTION VI

CRISIS MANAGEMENT OPTIONS

1. MANAGEMENT OPTIONS TO AVOID POTENTIAL CRISES

This section is a management guide to contingency planning for crisis management relating to "third party" supply of thermal and/or electrical energy to U.S. Air Force base installations in the United States. Incorporation of these issues in contract negotiations will not only result in reduced uncertainty regarding "third party" operation, but will also implement FY 1985-89 Defense Guidance by improving "energy security through energy vulnerability scenario development, project planning, and project selection . . ." These options will also aid in the consideration of the cogeneration capability at facilities supported, to reduce outside demands as part of Integrated Logistics Support (AFR 800-8(3)).

2. CRISIS MANAGEMENT

The flowchart shown in Figure 2 demonstrates graphically the major elements involved in crises management. It is imperative that each Air Force installation use an efficient system to provide each of the informational elements on a timely basis to a central command or decision element for action.

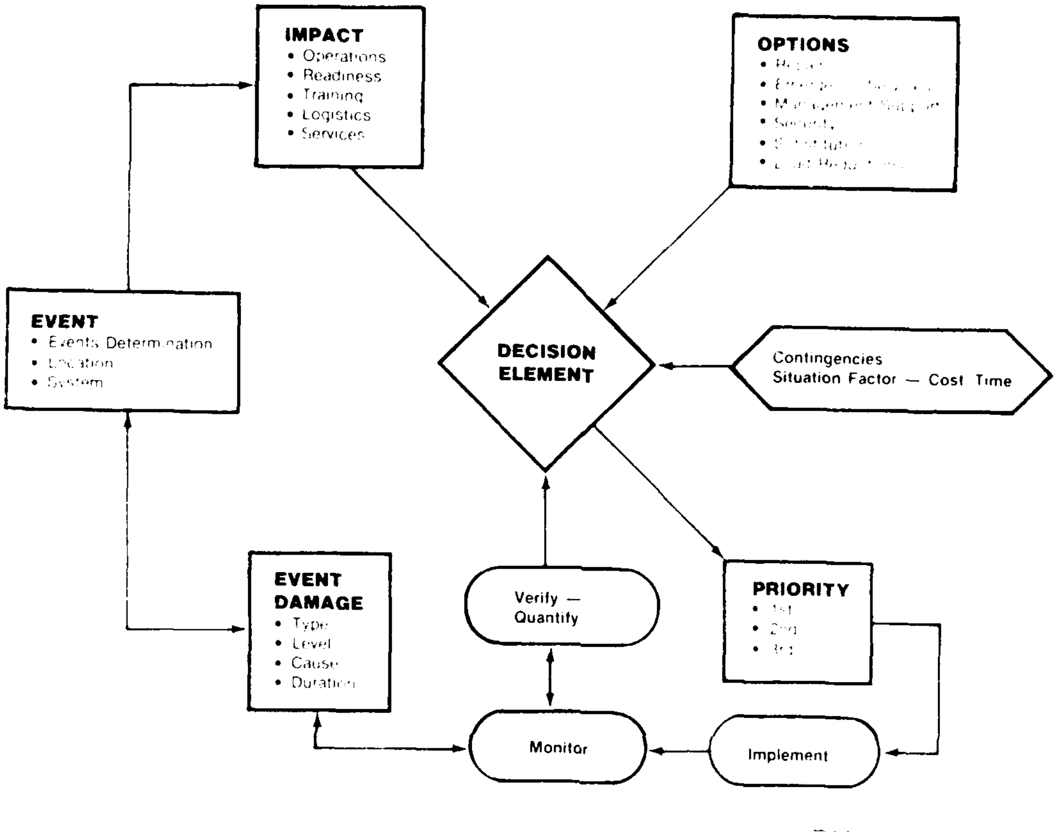
First, the system must be able to detect at the earliest possible time that a particular "event" has occurred. To accomplish this, alternatively-financed facilities must be connected to base detection and alarm systems for crises such as fire or security breaches. The mechanism for detection should vary according to the risks involved without event.

Second, the base crises management system must define the characteristics of the "event"; e.g., the type, level, and cause of the damage as well as its anticipated duration. This must be an iterative process throughout the crises. The system should monitor the situation, verify and quantify the damage occurring, and feed this information back to the central decision element.

Third, the impact of the "event" on Air Force operations and readiness must be ascertained as well as its impact on training, logistics, and services capabilities. The potential impact on these capabilities should be defined ahead of time for major event scenarios to reduce the response time as well as to improve the quality of the initial decisions made. Of equal importance (as shown at Minot AFB and Spangdahlum Air Base) is the fact that these assessments may aid in identifying potential vulnerabilities as well as the specific actions necessary to reduce or eliminate them.

Next, the Command Center must be provided with options from which to choose a course of action. Most of these should be defined in advance for major events. Selection of the appropriate option is influenced by situational contingencies such as cost and/or time. Depending on the potential impact of a particular event, each might be a limiting factor.

Figure 2
CRISIS MANAGEMENT FLOWCHART



3. OPTIONS TO DEAL WITH POTENTIAL CRISES

a. Labor Instability

Criteria	Options
(1) Ensure adequate alternative manpower is available.	(a) Use "third parties" that have available alternative manpower (e.g., utility management); (b) require cross training of civilian and military manpower; and (c) assign reserve training billets to generation plant.

(2) Use technologies that require few people to operate (e.g., gas, turbine, peaking plants) for critical facilities.

(3) Maintain backup generation facilities under AF primary control.

(a) Maintain old AF thermal plants under AF control; and

(b) require backup facilities to be manned by AF personnel (and maintained by contractor personnel).

b. Fuel Supply Shortages

Criteria	Options
(1) Specify minimum practical capability without resupply.	(a) Onbase fuel storage requirements (ea. 90-120 days); (b) use technologies with onbase energy sources (geothermal, waste disposal, and biomass); and (c) use technologies with compact energy storage.
(2) Reduce dependence on a single off-base energy source.	(a) Require a dual-fuel utilization capability; (b) specify standby equipment with alternate fuel capability; in most circumstances, the standby unit(s) should be capable of burning onbase oil stocks; (c) ensure redundant supply capability through multiple fuel source procurement capability; (d) provide access to government (DFSC & AF) utility fuel stocks; and (e) DPA.

c. Equipment Failure

Criteria	Options
(1) Acquire reserve generation capacity.	(a) Maintain excess generation capacity to cover planned maintenance and unplanned failure in key generation components (e.g., boiler, feedwater pumps, condensate pumps); and

Criteria	Options
	(b) require separate standby generation capability to meet a minimum or greater operational requirement (San Diego).
(2) Maintain parallel base supply capabilities.	(a) Maintain electrical grid connections and utilize "third-party" generated electricity during grid outages or during periods where utility-avoided costs are less than installation purchase costs; and
	(b) maintain in-house capability or contractor maintain existing thermal onbase generation facilities as backup to new "third-party" plants.

d. Fire

Criteria	Options
(1) Separate standby from operational equipment.	(a) Require a fire wall between operational and standby equipment; and
	(b) require standby generators to be housed in a separate building.
(2) Maintain adequate fire control measures.	(a) Ensure provision of adequate automatic fire suppression systems for fuel handling, storage, and generating plant facilities; and
	(b) ensure that if "third-party" plant is onbase it is connected to base alarm and fire response systems.
(3) Maintain adequate backup generation capability.	(a) Same as for equipment failure.

e. Physical Security

Criteria	Options
(1) Ensure that physical security of energy supplies is enhanced by "third party" operations.	(a) Locate "third-party" operation within base security perimeters; enhanced security is provided if the plant is not located at the base perimeter;
	(b) require physical security provisions of "third-party" equal to that provided by AF security police; including video monitoring;

(c) establish joint security provisions with hook-up to AF security and surveillance systems; and

(d) require clearance of all unaccompanied contractor personnel requiring access to the "third party" plant. Accompany all other people requiring access.

Criteria	Options
(2) Ensure that thermal and electrical generation plants are as survivable as the facilities they serve without backup.	(a) To the extent that "third party" plants provide power or heat to mission critical facilities without on-base backup alternatives they should have hardened or berm enclosures with equal survivability characteristics to these mission-critical facilities; and
	(b) provide on-base redundant capabilities to replace potentially unreliable plants (especially wind and solar).

f. Financial Insolvency or Unprofitability

Criteria	Options
(1) Ensure contractor interest in generation facility throughout the life of contract.	(a) Require adequate insurance against insolvency as part of the "third party" contract;
	(b) have a portion of the contract payment tied to maintenance of the generation facility in "good working order" subject to arbitration procedures;
	(c) contract with "third parties" with adequate financial backing; and
	(d) strive for situations where a significant portion of the return to the investing party comes from operations vs. tax or other financial-leverage returns.

g. Acts of God (flood, earthquake, tornado, hurricane)

Criteria	Options
(1) Ensure survivability.	(a) Review "third party" plans to ensure that facilities proposed meet AF standards for survivability; and (b) provide redundant on-base distribution systems (looped primary and primary selective distribution).
(2) Maintain operability.	(a) Have equipment installed above potential flood areas; (b) ensure contractual access in emergency situations; ensure that adequate training has been provided to Civil Engineering personnel to maintain operations; (c) use technologies not highly susceptible to weather (avoiding wind or solar) for critical facilities or provide 100 percent redundant backup capability; and (d) stock critical spares.

h. Military Conflict

Criteria	Options
(1) Ensure that adequate personnel are available for operating facility at all times.	(a) Require cross-training of AF civilian and/or nondeploying military personnel; (b) establish contractual recognition of national emergency and security requirements for taking over "third-party" operations and consequential reimbursement to the owners; (c) set up reserve training billets with immediate call-up capability; active duty positions should involve "third party" plant operation during emergency situations; and

(d) draft exemption to critical personnel.

i. Contractual Disputes

Criteria	Options
Formally recognize methods of solving contractual disputes relating to termination by either party, payment for energy supplied, payment for energy availability and emergency definition and the rights of both parties.	(a) Establish rights and valuation procedures for termination for fault or convenience of the government; and (b) ensure that contract provisions expressly deal with escalation due to inflation, fuel price increases, and utility cost avoidance payment calculations.

j. Base Closure

Criteria	Options
Provide contractual recognition of termination rights of the "third party" based on the convenience of the government.	(a) Continue pay base price for duration of contract; (b) buy-out debt; and (c) arbitrate project payoff debt plus potential profit.

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SECTION VII

OVERALL RISK ASSESSMENT

1. INTRODUCTION

Third Party Financing and management of installation energy production may not carry "more risk" than current methods of procurement. However, they pose a different set of risks which must be recognized and managed. The overall risk inherent in either provision mechanism is the lack of adequate installation power and thermal energy to fulfill mission requirements. Secondary to that is the risk of inadequate energy (in time or amount) to maintain "normal" installation operations, readiness, and training. The remaining major risk is that of nonoptimum utilization of financial resources. In other words, there is the risk that this energy is not acquired at the lowest possible expense, given time, personnel, budget, operational situation, and national policy constraints. The following discussion will address these risks as well as provide some recommendations for reducing those risks associated with Third Party Financing strategies for installation energy procurement.

2. RISK ANALYSIS

a. Operational

As demonstrated inadvertently at Hill AFB in 1981 and during tests at Minot AFB and Spangdahlem AB during 1982, current power and thermal resources carry significant risks of mission impact that can be associated with unplanned outages. From a utility standpoint, the greatest vulnerability is one of distribution, not generation. This was demonstrated on a large scale during the 1965 Northeast blackout affecting 13 million people up to 13 hours and during the famous New York blackout in 1977 which lasted up to 27 hours. Looped distribution and grid interconnections are two means employed to overcome these contingencies.

Utilities generally maintain a 20-percent reserve margin to cope with equipment failure, surge increases, and planned maintenance. However, an EPRI study indicates that an average 7 percent of total capacity is unavailable due to forced outages, while an additional 10 percent is unavailable due to scheduled maintenance (5 percent) and partial outages and deratings (5 percent). Thus, there is considerably less excess margin in the system than is generally recognized. Specific utility generation problems are generally overcome through wheeling power from one utility to another, overcoming temporary generation shortfalls in one particular area. Thus, the major risks associated with utility electrical supply are currently associated with transmission vulnerabilities.

Emergency generator power is provided to critical Air Force facilities according to AFM 88-15 and AFR 91-4. However, as demonstrated in the aforementioned circumstances, not all facilities required for full sustained operations are provided with backup power, and the ability of an installation to operationally maintain all the Real Property Installed Equipment (RPIE) or Equipment Authorized Inventory Data (EAID) generators during prolonged outages is questionable.

To the extent that Third Party Financed central heat plants are cogenerators, they can provide an additional backup electrical generation capability. By providing a potential dedicated source of power in case of grid failure, cogenerators could be sized to service a minimum electrical load at all times in addition to the existing diesel generators. Thus, more Air Force facilities could be serviced during an outage and critical facilities could have redundant backup power sources. By maintaining electrical grid interconnections and, in most cases, purchasing power from the utilities except during outages, the inherent risks of equipment outage in a single generating facility (versus multiple facilities) can be overcome. From an electrical standpoint, Third Party Financed cogeneration facilities will reduce the risks of an unplanned electrical outage having an operational impact.

Central heat plants owned by the Air Force and operated by a combination of Air Force civilian and military personnel carry certain operational risks. Many Air Force central heating plants are not equipped to operate without electrical power from the grid. The risks of equipment failure are partially overcome by generation multiplicity (boilers) designed to accommodate maintenance and variable loads and redundancy in critical equipment areas (e.g., feedwater pumps). In many Third Party Financed projects (e.g., Navy - San Diego, California State cogeneration projects), complete standby thermal generation capacity is required. This is obtained either by maintaining existing heat plants in a backup status or by requiring the "third- party" cogenerator to provide a complete 100 percent load backup boiler for emergency steam or hot water production. In either case, from an equipment standpoint, a reduction in risk loss has been achieved by contractual redundancy requirements. The risk of actual equipment failure may be less with newer equipment regardless of ownership.

b. Financial

The major area of risk in Third Party Financing involves the future financial uncertainties of fuel supply costs, avoided cost payments by utilities for cogenerated electricity, and tax legislation and rulings. Major changes in any of these three elements can alter the financial viability of a project. Fuel cost uncertainty affects Air Force-owned as well as "third-party" operations. Certain technologies (e.g., geothermal) and designs (e.g., dual fuel boilers) can be chosen in either situation to reduce the potential variables. However, since for any given set of equipment both the Air Force and a "third party" face the same risks of fuel supply cost fluctuation, this could be contractually shared. Availability of fuel, apart from contractual storage requirements, poses similar risks unless the Defense Production Act is invoked, both unlikely (unless during conflict) and potentially unwieldy in actual operation.

3. RECOMMENDED ACTIONS TO NULLIFY, REDUCE, OR ASSUME RISKS

To the extent the Air Force is unwilling to absorb risks, the "third party" must cover these contingencies or face possible financial insolvency downstream. Either situation is expensive to the Air Force. California has found it prudent to share the entire operational risks (percentage before tax cash flow) with "third-party" developers to effectively accommodate project financial risks.

Heat plant operations have been built and internally funded based on requirements. This has not necessarily led to financial efficiency. A comparison of capital costs of coal fuel energy plants between the private sector and the Army by the U.S. Army Facility Engineering Support Agency has shown a cost ratio of up to 1:2, respectively. Thus, participation in private sector profit objectives may, indeed, offer a more efficient utilization of capital to the Air Force, not to mention the practical budgetary limitations on funds' availability.

Arguments have been made for Air Force ownership of central heat plants based on the need to provide personnel training and rotational assignments to meet mission requirements for Air Force facilities abroad. Electrical power provided by the private sector has not posed this problem with emergency generation training and manpower assignments being currently accommodated. Central heat plants could be handled in much the same way. However, new generation technology requires few people to operate the equipment on a daily basis.

Contractual security requirements and agreements on the provision of emergency services by the Air Force (for fire, acts of God, etc.) should render these risks independent of plant ownership.

In summary, alternatively-financed energy plants can reduce the current risks associated with Air Force energy procurement methods if the proper contractual terms are established for each potential project.

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